

METHOD 3A DETERMINATION OF CARBON DIOXIDE AND OXYGEN FROM STATIONARY SOURCES

Applicability and Principle

A sample is continuously extracted from the effluent stream portion of the sample stream is conveyed to an instrumental analyzer(s) for the determination of CO₂ and O₂ concentrations. Performance specifications and test procedures are provided to ensure reliable data.

Apparatus

A **measurement system** for Carbon Dioxide and Oxygen that meets the specifications of this method will be used.

The **Sample Probe** will be glass, stainless steel, or equivalent, of sufficient length to traverse the sample points. The sampling probe shall be heated to prevent condensation.

The **Sample Line** will be heated (sufficient to prevent condensation) stainless steel or Teflon® tubing, to transport the sample gas to the moisture removal system.

The **Moisture Removal System** will be a refrigerator-type condenser or similar device to continuously remove condensate from the sample gas while maintaining minimal contact between the condensate and the sample gas.

The **Sample Transport Lines** will be stainless steel or Teflon tubing, to transport the sample from the moisture removal system to the sample pump, sample flow rate control, and sample gas manifold.

A **Calibration Valve Assembly** with a three-way valve assembly, or equivalent, for blocking the sample gas flow and introducing calibration gases to the measurement system at the outlet of the sampling probe when in the calibration mode will be utilized.

A **Particulate Filter**, either an in-stack or heated (sufficient to prevent water condensation) out-of-stack filter will be used. The filter will be borosilicate or quartz glass wool, or glass fiber mat. All filters will be fabricated of materials that are nonreactive to the gas being sampled.

A **Leak-free Pump**, to pull the sample gas through the system at a flow rate sufficient to minimize the response time of the measurement system will be used. The pump will be constructed of any material that is nonreactive to the gas being sampled.

A **Recorder**, a strip-chart recorder, analog computer, or digital recorder for recording measurement data. The minimum data recording requirement is one measurement value per minute.

Analytical Range

The span of the monitoring system will be selected such that the applicable gas concentration is not less than 20% of the span. If at any time during the run the measured gas concentration exceeds the span; the run will be considered invalid.

The in stack concentration is expected to be _____ for O₂.

The in stack concentration is expected to be _____ for CO₂.

The proposed analyzer span to be used during testing is _____ for O₂.

The proposed analyzer span to be used during testing is _____ for CO₂.

CALIBRATION GASES

Calibration Gases

All calibration procedures and acceptance criteria of Method 6C will be adhered to. The calibration gases will be (check one):

___ EPA Protocol No. 1 gases.

___ Gas mixtures certified by the manufacturer not to exceed $\pm 2\%$ of the tag value. If this method is used, concentration verification will be performed per Section 6.1 of Method 3A and the documentation will be included in the final test report.

The calibration gases for CO₂ analyzers will be CO₂ in N₂ or CO₂ in air, or a gas mixture listed in Section 5.2 of the method.

The **zero gas** will be less than 0.25 percent of span. The zero gas concentration to be used during the source test will be _____.

The **mid-range** calibration gas will be equivalent to 40 to 60 percent of the span. The mid-range gas to be used during the source test will be _____ for O₂ and _____ for CO₂.

The **high-range** gas will be equivalent to 80 to 90 percent of the span. The high range gas to be used during the source test will be _____ for O₂ and _____ for CO₂.

Analyzer Calibration

The analyzer calibration error check will be conducted by introducing the zero, mid-range, and high-range gases to the analyzer. During this check, no adjustments to the system will be made except those necessary to achieve the correct calibration gas flow rate at the analyzer. The analyzer responses to each calibration gas will be recorded. The analyzer calibration error check will be considered invalid if the gas concentration displayed by the analyzer exceeds ± 2 percent of the span for any of the calibration gases.

The sampling system bias check will be performed by introducing first an upscale gas (mid-range) at the calibration valve assembly installed at the outlet of the sampling probe, and then the zero gas. During this check, no adjustments to the system will be made except those necessary to achieve the correct calibration gas flow at the analyzer. This check will be considered invalid if the difference between the calibration error check and the calibration bias check for the same calibration gas exceeds $\pm 5\%$ of the span.

Emission Measurement Test Procedure

A sample point that is representative of the source emission concentration must be selected. The sampling probe will be placed at the sample point and sampling will begin at the same rate used during the bias check. A constant rate ± 10 percent will be maintained during the entire sample run. Sampling will commence only after twice the response time has elapsed.

Immediately following the completion of the test period and hourly during the test period, the zero and mid-level calibration gases will be re-introduced one at a time to the measurement system at the calibration valve assembly. No adjustments to the measurement system will be made until both the zero and calibration bias and drift checks are made. The analyzer response will be recorded. If the bias values exceed the specified limits, the test results preceding the check will be invalidated and the test will be repeated following corrections to the measurement system and full recalibration. If the drift values exceed the specified limits, the run may be accepted but the test measurement system will be fully recalibrated and the results reported using Equation 6C-1 from Method 6C.

Measurement System Performance Specifications

Zero Drift, less than or equal to ± 3 percent of the span value. **Calibration Drift**, less than or equal to ± 3 percent of span value. **Sampling System Bias**, less than or equal to ± 5 percent of span value. **Calibration Error**, less than or equal to ± 2 percent of span.

Emission Calculation

All CO₂ analyzers and O₂ analyzers that can be calibrated with zero gas will follow Section 8 of Method 6C, except all concentrations will be expressed as percent, rather than ppm. The concentrations will be calculated using Equation 6C-1 from Method 6C.

All O₂ analyzers that use a low-level calibration gas (less than 10% of span) in place of a zero gas will calculate the effluent gas concentration using the Equation 3A-1 of the method. This type of analyzer (select one)

_____ will be used.
_____ will not be used.

Proposed Deviations from this BTS Template or the Method

(Insert any proposed deviations here)